GRAVITY MODELLING OF THE SANTA MARTA IMPACT STRUCTURE, NORTHEASTERN BRAZIL. A. B. M.A.R. Vasconcelos, A.P. Crósta and E. P. Leite. University of Campinas, Brazil. E-mail: vasconcelos@ige.unicamp.br.

Introduction: The Santa Marta impact structure is a complex impact crater centered at 10°10'S/45°14'W, in Piauí State, northeastern Brazil. It was formed in sedimentary rocks of the Parnaíba Basin and SanFranciscan Basin, comprised by sandstones and shales. It has a diameter of ~10 km, and its western rim is ~100 meters topographically higher than the eastern rim. The inner elevation is defined by a large plateau which extends from the central region towards southwest with an irregular shape. The impact origin of the crater was proved based on data acquired during a geological field campaign carried out in 2012. Subsequent field work has gathered a great amount of geological and geophysical data about Santa. [1]. Shock deformation features were described by [2]. We have collected gravity data inside and outside the crater and found that its signature is atypical when compared to other impact craters. A subsurface gravity model depicts a central elevation due to a high-positive anomaly and vertical strata surrounding the central uplift.

Data Processing: Gravity data were collected at 162 stations, with a Scintrex CG-05 AUTOGRAV gravimeter of 0.001 mGal precision. Standard temporal and spatial corrections [3] were applied to obtain the Bouguer anomaly. A first order polynomial representing the regional gravity field was removed from the data. A gravity model was built along NW-SE direction based on geological mapping carried out by our research group the University of Campinas. This model is composed of five polygons with their respective densities representing sedimentary rocks of the Urucuia Group, polymict breccia, sedimentary rocks of the Areado Formation, monomict breccia and strata from the Parnaíba Basin. The median error for the calculated anomaly is 0.94 mGal. Typical density values for the target rocks (sandstones and shales) were based on [3].

Results: The general signature of the Santa Marta is a low-gravity anomaly in the area which corresponds to the annular basin surrounded by a high-anomaly corresponding to the crater rim. This signature undergoes variations with local positive/negative anomalies of short-wavelengths within the crater. According to the results obtained by geological mapping of the crater, the central lithotype is comprised by polymict breccias, also found in the northwestern rim. In that sector of the rim the breccias reache a maximum depth of ~800 meters. The high anomaly observed in the western rim may be related to uplift under this part of the rim, whereas in the eastern rim, this elevation seems to be less prominent. The strata of the Parnaíba Basin are the lithotype represented with lower density value, which show ~300 meters of uplift in the bottom of the layer. Additionally, the model indicates that the strata in the central uplift are dipping almost vertically, which is in agreement with field observations.

Conclusions: The gravity signature of the Santa Marta impact structure shows an asymmetry of the structure with more elevated strata in the western rim compared to the eastern rim. The center of the crater is marked by an uplift that would be responsible for the central elevation in the field.

References: [1] Vasconcelos M. A.R. 2013. Abstract #1314. 44th Lunar & Planetary Science Conference. [2] Uchôa E.B. 2013. Abstract #1316. 44th Lunar & Planetary Science Conference. [3] Telford et al. 1991.